

PRELIMINARY AMENDMENT  
Attorney Docket No. Q62515

REMARKS

Claims 1-35 are pending in the present application. The claims have been reviewed and amended where appropriate to place the claims in more accepted format for U.S. patent practice, and use the U.S. usage of certain words. No new matter has been added. Accordingly, entry of the present Amendment is requested.

Respectfully submitted,

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APPENDIX

VERSION WITH MARKINGS TO SHOW CHANGES MADE

IN THE CLAIMS:

The claims are amended as follows:

1. (Amended) A method for producing [providing] a coated [moulded] molded polymer article [in which:] including the steps:

a) providing a polymer A having pendant reactive groups and zwitterionic groups X;  
b) providing a mold, molding surfaces of which are substantially free of surface functional groups capable of reacting to form covalent bonds with said pendant reactive groups of polymer A;

[a]c) providing at least a portion of the surface of [a mould is provided] the mold with a coating of polymer A, [having pendant reactive groups, wherein the mould is substantially free of surface functional groups capable of reacting to form covalent bonds with pendant reactive groups of polymer A,]

[b]d) providing a liquid curable composition comprising a functional compound reactive with the reactive groups of polymer A, [is contacted]

e) contacting said liquid curable composition with the [mould] mold whereby the composition is in contact with the coated portions of the mould surface, and

[c]f) curing the curable composition [is cured] to form bulk polymer B under [condition] conditions such that reaction takes place between [the] said functional compound and the reactive groups of polymer A to form a covalent bond linking polymer A to polymer B at least at the interface between the coating and bulk polymer B,

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g) and demolding the bulk polymer B with polymer A coating [is demoulded, characterised in that polymer A includes zwitterionic groups X].

3. (Amended) A method according to claim 1 or claim 2 in which in groups X, the atom bearing an anionic charge and the atom bearing a cationic charge are separated by 2 to 12 atoms[, preferably 2 to 8, more preferably 2 to 6 atoms].

4. (Amended) A method according to claim 3, in which the cation is further from the polymer backbone than from the anion.

5. (Amended) A method according to [any preceding] claim 1 in which the cationic group is a quaternary ammonium group.

6. A method according to [any preceding] claim 1 in which the anionic group is a phosphate diester group.

7. A method according to any preceding claim 1 in which X is of formula VI



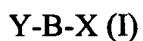
where the groups R<sup>12</sup> are the same or different and each is hydrogen or C<sub>1-4</sub> alkyl, and e is from 1 to 4.

8. (Amended) A method according to [any preceding] claim 1 in which polymer A is formed by radical [polymerisation] polymerization of ethylenically unsaturated monomers.

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9. A method according to claim 8, in which the ethylenically unsaturated monomers include:

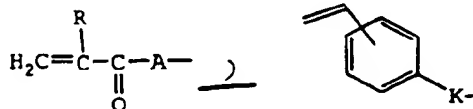
- a) a zwitterionic monomer of the general formula I



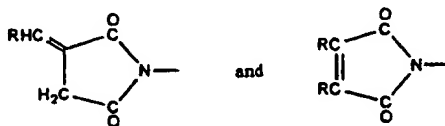
wherein B is a straight or branched alkylene, oxaalkylene or oligo-oxaalkylene chain optionally containing one or more fluorine atoms up to and including perfluorinated chains or, if X or Y contains a terminal carbon atom bonded to B, a valence bond;

X is the zwitterionic group and

Y is an ethylenically unsaturated [polymerisable] polymerizable group selected from the group consisting of



$\text{CH}_2=\text{C}(\text{R})-\text{CH}_2-\text{O}-$ ,  $\text{CH}_2=\text{C}(\text{R})-\text{CH}_2 \text{OC}(\text{O})-$ ,  $\text{CH}_2=\text{C}(\text{R})\text{OC}(\text{O})-$ ,  $\text{CH}_2=\text{C}(\text{R})-\text{O}-$ ,  
 $\text{CH}_2=\text{C}(\text{R})\text{CH}_2\text{OC}(\text{O})\text{N}(\text{R}^1)-$ ,  $\text{R}^{30}\text{OOC}\text{CR}=\text{CRC}(\text{O})-\text{O}-$ ,  $\text{RCH}=\text{CHC}(\text{O})\text{O}-$ ,  
 $\text{RCH}=\text{C}(\text{COOR}^{30})\text{CH}_2-\text{C}(\text{O})-\text{O}-$ ,



wherein:

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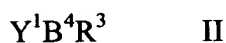
R is hydrogen or a C<sub>1</sub>-C<sub>4</sub> alkyl group;

R<sup>30</sup> is hydrogen or a C<sub>1-4</sub> alkyl group; or BX

A is -O- or -NR<sup>1</sup>-; R<sup>1</sup> is hydrogen or a C<sub>1</sub>-C<sub>4</sub> alkyl group or R<sup>1</sup> is -B-X where B and X are as defined above; and

K is a group -(CH<sub>2</sub>)<sub>p</sub>OC(O)-, -(CH<sub>2</sub>)<sub>p</sub>C(O)O-,  
-(CH<sub>2</sub>)<sub>p</sub>OC(O)O-, -(CH<sub>2</sub>)<sub>p</sub>NR<sup>2</sup>-, -(CH<sub>2</sub>)<sub>p</sub>NR<sup>2</sup>C(O)-,  
-(CH<sub>2</sub>)<sub>p</sub>C(O)NR<sup>2</sup>-, -(CH<sub>2</sub>)<sub>p</sub>NR<sup>2</sup>C(O)O-, -(CH<sub>2</sub>)<sub>p</sub>OC(O)NR<sup>2</sup>-,  
-(CH<sub>2</sub>)<sub>p</sub>NR<sup>2</sup>C(O)NR<sup>2</sup>-, [in which the groups R<sup>2</sup> are the same or different()], -(CH<sub>2</sub>)<sub>p</sub>O-,  
-(CH<sub>2</sub>)<sub>p</sub>SO<sub>3</sub>-, or, optionally in combination with B, a valence bond and p is from 1 to 12 and R<sup>2</sup> is hydrogen or a C<sub>1</sub>-C<sub>4</sub> alkyl group and

b) a reactive functional monomer of the formula II

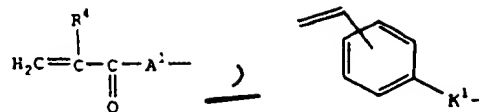


wherein

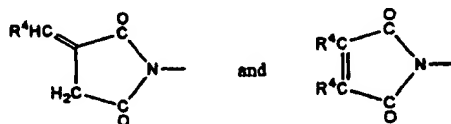
B<sup>4</sup> is a straight or branched alkylene, oxaalkylene or oligo-oxaalkylene chain optionally containing one or more fluorine atoms up to and including perfluorinated chains, or a valence bond;

Y<sup>1</sup> is an ethylenically unsaturated [polymerisable] polymerizable group selected from the group consisting of

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$\text{CH}_2=\text{C}(\text{R}^4)-\text{CH}_2-\text{O}-$ ,  $\text{CH}_2=\text{C}(\text{R}^4)-\text{CH}_2\text{OC}(\text{O})-$ ,  $\text{CH}_2=\text{C}(\text{R}^4)\text{OC}(\text{O})-$ ,  $\text{CH}_2=\text{C}(\text{R}^4)-\text{O}-$ ,  
 $\text{CH}_2=\text{C}(\text{R}^4)\text{CH}_2\text{OC}(\text{O})\text{N}(\text{R}^5)-$ ,  $\text{R}^{31}\text{OCCR}^4=\text{CR}^4\text{C}(\text{O})-\text{O}-$ ,  $\text{R}^4\text{H}=\text{CHC}(\text{O})-\text{O}-$ ,  
 $\text{R}^4\text{H}=\text{C}(\text{COOR}^{31})\text{CH}_2\text{C}(\text{O})\text{O}-$



where  $\text{R}^4$  is hydrogen or  $\text{C}_1\text{-C}_4$  alkyl;

$\text{R}^{31}$  is hydrogen, a  $\text{C}_{1-4}$  alkyl group or a group  $\text{B}^4\text{R}^3$ ;

$\text{A}^1$  is  $-\text{O}-$  or  $-\text{NR}^5-$ ;  $\text{R}^5$  is hydrogen or a  $\text{C}_1\text{-C}_4$  alkyl group or  $\text{R}^5$  is a group  $[\text{Q}] \text{B}^4\text{R}^3$ ;

$\text{K}^1$  is a group  $-(\text{CH}_2)_1\text{OC}(\text{O})-$ ,  $-(\text{CH})_1\text{C}(\text{O})\text{O}-$ ,

$-(\text{CH}_2)_1\text{OC}(\text{O})\text{O}-$ ,  $-(\text{CH}_2)_1\text{NR}^6-$ ,  $-(\text{CH}_2)_1\text{NR}^6\text{C}(\text{O})-$ ,

$-(\text{CH}_2)_1\text{C}(\text{O})\text{NR}^6-$ ,  $-(\text{CH}_2)_1\text{NR}^6\text{C}(\text{O})\text{O}-$ ,  $-(\text{CH}_2)_1\text{OC}(\text{O})\text{NR}^6-$ ,  $-(\text{CH}_2)_1\text{NR}^6\text{C}(\text{O})\text{NR}^6-$  [(in which the groups  $[\text{R}^{16}] \text{R}^6$  are the same or different)],  $-(\text{CH}_2)_1\text{O}-$ ,  $-(\text{CH}_2)_1\text{SO}_3-$ , or a valence bond and 1 is from 1 to 12 and  $\text{R}^6$  is hydrogen or a  $\text{C}_1\text{-C}_4$  alkyl group;

and  $\text{R}^3$  is a reactive group.

10. (Amended) A method according to claim 9 in which  $\text{R}^3$  is selected from the group consisting of ethylenically and acetylenically unsaturated group containing radicals; aldehyde

groups; silane and siloxane groups containing one or more substituents selected from halogen atoms and C<sub>1-4</sub>-alkoxy groups; hydroxyl; amino; carboxyl; epoxy; -CHOHCH<sub>2</sub>Hal [(in which Hal is selected from the group consisting of chlorine, bromine and iodine atoms)]; succinimido; tosylate; triflate; imidazole carbonyl amino; optionally substituted triazine groups; acetoxy; mesylate; carbonyl di(cyclo)alkyl carbodiimidoyl; isocyanate, acetoacetoxy; and oximino.

11. (Amended) A method according to claim 9 [or claim 10] in which, in the reactive comonomer, R<sup>3</sup> is an ethylenically unsaturated group[, preferably a group CH<sub>2</sub>=CH-, most preferably in which the reactive comonomer is allyl methacrylate].

12. (Amended) Method according to claim 11 [involving a preliminary step of polymerising] in which step d) comprises the step of polymerizing ethylenically unsaturated monomers under radical [polymerisation] polymerization conditions to form a substantially non-cross-linked polymer A, under conditions such that ethylenically unsaturated groups R<sup>3</sup> do not [polymerise] polymerize to any significant degree.

13. (Amended) A method according to [any preceding] claim 1 in which the curable composition comprises ethylenically unsaturated monomers and/or pre-polymer and the curing involves radical [polymerisation] polymerization of the ethylenically unsaturated [polymerisable] polymerizable groups.

15. (Amended) A method according to [any of claims 1 to 12] claim 1 in which the curable composition comprises siloxane prepolymers and the polymer B is a platinum-cured polysiloxane.

16. (Amended) A method for [providing] producing a coated [moulded] molded polymer article [in which] including the steps:

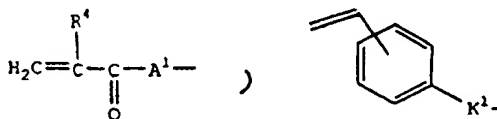
a) providing a polymer A' which is a substantially non-crosslinked polymer having pendant reactive groups formed from ethylenically unsaturated monomers including monomer of the general formula IX



IX

where B<sup>4</sup> is a straight or branched alkylene, oxaalkylene or oligo-oxaalkylene chain optionally containing one or more fluorine atoms up to and including perfluorinated chains, or a valence bond;

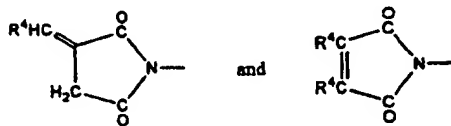
Y<sup>1</sup> is an ethylenically unsaturated polymerizable group selected from the group consisting of



CH<sub>2</sub>=C(R<sup>4</sup>)-CH<sub>2</sub>-O-, CH<sub>2</sub>=C(R<sup>4</sup>)-CH<sub>2</sub>OC(O)-, CH<sub>2</sub>=C(R<sup>4</sup>)OC(O)-, CH<sub>2</sub>=C(R<sup>4</sup>)-O-,

CH<sub>2</sub>=C(R<sup>4</sup>)CH<sub>2</sub>OC(O)N(R<sup>5</sup>)-, R<sup>31</sup>OCC(R<sup>4</sup>)=CR<sup>4</sup>C(O)-O-, R<sup>4</sup>H=CHC(O)-O-,

R<sup>4</sup>H=C(COOR<sup>31</sup>)CH<sub>2</sub>C(O)O-





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where R<sup>4</sup> is hydrogen or C<sub>1</sub>-C<sub>4</sub> alkyl;

R<sup>31</sup> is hydrogen, a C<sub>1-4</sub> alkyl group or a group B<sup>4</sup>R<sup>3</sup>;

A<sup>1</sup> is -O- or -NR<sup>5</sup>-; R<sup>5</sup> is hydrogen or a C<sub>1</sub>-C<sub>4</sub> alkyl group or R<sup>5</sup> is a group B<sup>4</sup>R<sup>15</sup>;

K<sup>1</sup> is a group -(CH<sub>2</sub>)<sub>1</sub>OC(O)-, -(CH)<sub>1</sub>C(O)O-,

-(CH<sub>2</sub>)<sub>1</sub>OC(O)O-, -(CH<sub>2</sub>)<sub>1</sub>NR<sup>6</sup>-, -(CH<sub>2</sub>)<sub>1</sub>NR<sup>6</sup>C(O)-,

-(CH<sub>2</sub>)<sub>1</sub>C(O)NR<sup>6</sup>-, -(CH<sub>2</sub>)<sub>1</sub>NR<sup>6</sup>C(O)O-, -(CH<sub>2</sub>)<sub>1</sub>OC(O)NR<sup>6</sup>-, -(CH<sub>2</sub>)<sub>1</sub>NR<sup>6</sup>C(O)NR<sup>6</sup>- in which the groups R<sup>16</sup> are the same or different, -(CH<sub>2</sub>)<sub>1</sub>O-, -(CH<sub>2</sub>)<sub>1</sub>SO<sub>3</sub>-, or a valence bond and 1 is from 1 to 12 and R<sup>6</sup> is hydrogen or a C<sub>1</sub>-C<sub>4</sub> alkyl group; and

R<sup>15</sup> is a reactive group and comprises an ethylenically unsaturated group, provided that R<sup>15</sup> is not the same as Y<sup>1</sup>,

b) providing a mold,

[a)]c) providing at least a portion of the surface of [a mould is provided] the mold with a coating of polymer A<sub>n</sub>[having pendantly active groups,]

[b)]d) providing a liquid curable composition comprising a, functional compound reactive with [the] said reactive groups of polymer [A is contacted] A

e) contacting the liquid curable composition with the [mould] mold whereby the composition is in contact with the coated portions of the [mould] mold surface[, and];

[c)]f) curing the curable composition [is cured] to form bulk polymer B under [condition] conditions such that reaction takes place between [the] said functional compound and

the reactive groups of polymer [A] A' to form a covalent bond linking polymer [A] A' to polymer B at least at the interface between the coating and bulk polymer B; and

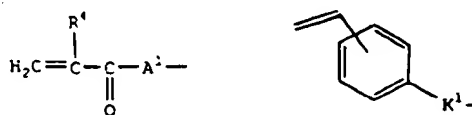
g) demolding the coated polymer product.

[B, characterised in that polymer A' is a substantially non-crosslinked polymer formed from ethylenically unsaturated monomers including monomer of the general formula IX

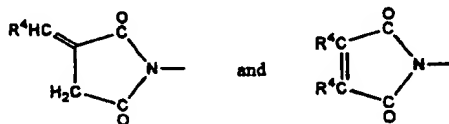


where B<sup>4</sup> is a straight or branched alkylene, oxaalkylene or oligo-oxaalkylene chain optionally containing one or more fluorine atoms up to and including perfluorinated chains, or a valence bond;

Y<sup>1</sup> is an ethylenically unsaturated polymerisable group selected from the group consisting of



CH<sub>2</sub>=C(R<sup>4</sup>)-CH<sub>2</sub>-O-, CH<sub>2</sub>=C(R<sup>4</sup>)-CH<sub>2</sub>OC(O)-, CH<sub>2</sub>=C(R<sup>4</sup>)OC(O)-, CH<sub>2</sub>=C(R<sup>4</sup>)-O-,  
CH<sub>2</sub>=C(R<sup>4</sup>)CH<sub>2</sub>OC(O)N(R<sup>5</sup>)-, R<sup>31</sup>OOC(R<sup>4</sup>)=C(R<sup>4</sup>)C(O)-O-, R<sup>4</sup>H=CHC(O)-O-,  
R<sup>4</sup>H=C(COOR<sup>31</sup>)CH<sub>2</sub>C(O)O-



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where  $R^4$  is hydrogen or  $C_1$ - $C_4$  alkyl;

$R^{31}$  is hydrogen, a  $C_{1-4}$  alkyl group or a group  $B^4R^3$ ;

$A^1$  is -O- -or - $NR^5$ -;  $R^5$  is hydrogen or a  $C_1$ - $C_4$  alkyl group or  $R^5$  is a group  $B^4R^{15}$ ;

$K^1$  is a group  $-(CH_2)_1OC(O)-$ ,  $-(CH)_1C(O)O-$ ,

$-(CH_2)_1OC(O)O-$ ,  $-(CH_2)_1NR^6-$ ,  $-(CH_2)_1NR^6C(O)-$ ,

$-(CH_2)_1C(O)NR^6-$ ,  $-(CH_2)_1NR^6C(O)O-$ ,  $-(CH_2)_1OC(O)NR^6-$ ,  $-(CH_2)_1NR^6C(O)NR^6-$  in which the groups  $R^{16}$  are the same or different,  $-(CH_2)_1O-$ ,  $-(CH_2)_1SO_3-$ , or a valence bond and 1 is from 1 to 12 and  $R^6$  is hydrogen or a  $C_1$ - $C_4$  alkyl group; and

$R^{15}$  is a reactive group and comprises an ethylenically unsaturated group, provided that  $R^{15}$  is not the same as  $Y^1$ .]

18. (Amended) A method according to claim 16 in which the curable composition comprises ethylenically unsaturated monomers and [the curing] step f) involves radical [polymerisation] polymerization of the ethylenically unsaturated [polymerisable] polymerizable  $R^{15}$  groups and said monomers.

19. (Amended) A method according to claim 18 [involving a preliminary step of] in which step d) comprises the step of [polymerising] polymerizing the ethylenically unsaturated monomers under radical [polymerisation] polymerization conditions to form [soluble] non-cross-linked polymer A, under conditions such that ethylenically unsaturated groups  $R^{15}$  do not [polymerise] polymerize to any significant degree.

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20. (Amended) A polymer formed by [polymerising] polymerizing ethylenically unsaturated monomers including

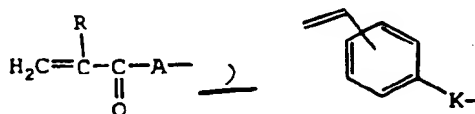
a) a zwitterionic monomer of the general formula I

Y-B-X (I)

wherein B is a straight or branched alkylene, oxaalkylene or oligo-oxaalkylene chain optionally containing one or more fluorine atoms up to and including perfluorinated chains or, if X or Y contains a terminal carbon atom bonded to B, a valence bond;

X is the zwitterionic group and

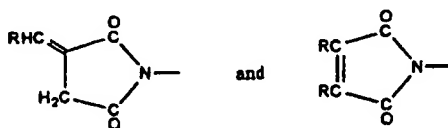
Y is an ethylenically unsaturated [polymerisable] polymerizable group selected from the group consisting of



$\text{CH}_2=\text{C}(\text{R})-\text{CH}_2-\text{O}-$ ,  $\text{CH}_2=\text{C}(\text{R})-\text{CH}_2 \text{OC}(\text{O})-$ ,  $\text{CH}_2=\text{C}(\text{R})\text{OC}(\text{O})-$ ,  $\text{CH}_2=\text{C}(\text{R})-\text{O}-$ ,

$\text{CH}_2=\text{C}(\text{R})\text{CH}_2\text{OC}(\text{O})\text{N}(\text{R}^1)-$ ,  $\text{R}^{30}\text{OCC}(\text{R})=\text{C}(\text{R})\text{OC}(\text{O})-\text{O}-$ ,  $\text{RCH}=\text{CHC}(\text{O})\text{O}-$ ,

$\text{RCH}=\text{C}(\text{COOR}^{30})\text{CH}_2-\text{C}(\text{O})-\text{O}-$ ,



wherein:

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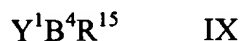
R is hydrogen or a C<sub>1</sub>-C<sub>4</sub> alkyl group;

R<sup>30</sup> is hydrogen or a C<sub>1-4</sub> alkyl group; or BX

A is -O- or -NR<sup>1</sup>-; R<sup>1</sup> is hydrogen or a C<sub>1</sub>-C<sub>4</sub> alkyl group or R<sup>1</sup> is -B-X where B and X are as defined above; and

K is a group -(CH<sub>2</sub>)<sub>p</sub>OC(O)-, -(CH<sub>2</sub>)<sub>p</sub>C(O)O-,  
-(CH<sub>2</sub>)<sub>p</sub>OC(O)O-, -(CH<sub>2</sub>)<sub>p</sub>NR<sup>2</sup>-, -(CH<sub>2</sub>)<sub>p</sub>NR<sup>2</sup>C(O)-,  
-(CH<sub>2</sub>)<sub>p</sub>C(O)NR<sup>2</sup>-, -(CH<sub>2</sub>)<sub>p</sub>NR<sup>2</sup>C(O)O-, -(CH<sub>2</sub>)<sub>p</sub>OC(O)NR<sup>2</sup>-,  
-(CH<sub>2</sub>)<sub>p</sub>NR<sup>2</sup>C(O)NR<sup>2</sup>-, [in which the groups R<sup>2</sup> are the same or different[]], -(CH<sub>2</sub>)<sub>p</sub>O-,  
-(CH<sub>2</sub>)<sub>p</sub>SO<sub>3</sub>-, or, optionally in combination with B, a valence bond and p is from 1 to 12 and R<sup>2</sup> is hydrogen or a C<sub>1</sub>-C<sub>4</sub> alkyl group and

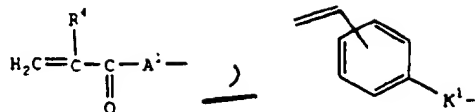
b) a dual ethylenically unsaturated monomer of the general formula IX:



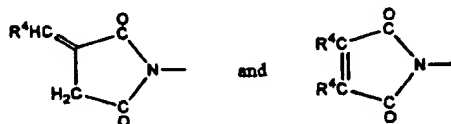
wherein B<sup>4</sup> is a straight or branched alkylene, oxaalkylene or oligo-oxaalkylene chain optionally containing one or more fluorine atoms up to and including perfluorinated chains, or a valence bond;

Y<sup>1</sup> is an ethylenically unsaturated [polymerisable] polymerizable group selected from the group consisting of

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$\text{CH}_2=\text{C}(\text{R}^4)\text{-CH}_2\text{-O-}$ ,  $\text{CH}_2=\text{C}(\text{R}^4)\text{-CH}_2\text{OC(O)-}$ ,  $\text{CH}_2=\text{C}(\text{R}^4)\text{OC(O)-}$ ,  $\text{CH}_2=\text{C}(\text{R}^4)\text{-O-}$ ,  
 $\text{CH}_2=\text{C}(\text{R}^4)\text{CH}_2\text{OC(O)N(R}^5)\text{-}$ ,  $\text{R}^{31}\text{OOC}\text{CR}^4=\text{CR}^4\text{C(O)-O-}$ ,  $\text{R}^4\text{H=CHC(O)-O-}$ ,  
 $\text{R}^4\text{H=C(COOR}^{31})\text{CH}_2\text{C(O)O-}$



where  $\text{R}^4$  is hydrogen or  $\text{C}_1\text{-C}_4$  alkyl;

$\text{R}^{31}$  is hydrogen, a  $\text{C}_{1-4}$  alkyl group or a group  $\text{B}^4\text{R}^3$ ;

$\text{A}^1$  is  $\text{-O-}$  or  $\text{-NR}^5\text{-}$ ;  $\text{R}^5$  is hydrogen or a  $\text{C}_1\text{-C}_4$  alkyl group [or  $\text{R}^5$  is a group Q];

$\text{K}^1$  is a group  $\text{-(CH}_2)_1\text{OC(O)-}$ ,  $\text{-(CH)}_1\text{C(O)O-}$ ,

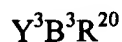
$\text{-(CH}_2)_1\text{OC(O)O-}$ ,  $\text{-(CH}_2)_1\text{NR}^6\text{-}$ ,  $\text{-(CH}_2)_1\text{NR}^6\text{C(O)-}$ ,

$\text{-(CH}_2)_1\text{C(O)NR}^6\text{-}$ ,  $\text{-(CH}_2)_1\text{NR}^6\text{C(O)O-}$ ,  $\text{-(CH}_2)_1\text{OC(O)NR}^6\text{-}$ ,  $\text{-(CH}_2)_1\text{NR}^6\text{C(O)NR}^6\text{-}$  [(in which the groups  $[\text{R}^{16}] \underline{\text{R}}^6$  are the same or different)],  $\text{-(CH}_2)_1\text{O-}$ ,  $\text{-(CH}_2)_1\text{SO}_3\text{-}$ , or a valence bond and 1 is from 1 to 12 and  $\text{R}^6$  is hydrogen or a  $\text{C}_1\text{-C}_4$  alkyl group;

$\text{R}^{15}$  is an ethylenically unsaturated organic group, and

c) cross-linkable monomer of the general formula X

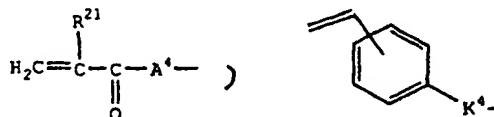
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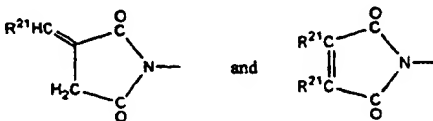
X

in which B<sup>3</sup> is straight or branched alkylene, oxaalkylene or oligo-oxaalkylene chain optionally containing one or more fluorine atoms up to and including perfluorinated chains, or a valance bond;

Y<sup>3</sup> is an ethylenically unsaturated [polymerisable] polymerizable group selected from the group consisting of



CH<sub>2</sub>=C(R<sup>21</sup>)-CH<sub>2</sub>-O-, CH<sub>2</sub>=C(R<sup>21</sup>)-CH<sub>2</sub>OC(O)-, CH<sub>2</sub>=C(R<sup>21</sup>)OC(O)-, CH<sub>2</sub>=C(R<sup>21</sup>)-O-,  
CH<sub>2</sub>=C(R<sup>21</sup>)CH<sub>2</sub>OC(O)N(R<sup>22</sup>)-, R<sup>29</sup>OOCCR<sup>21</sup>=CR<sup>21</sup>C(O)-O-, R<sup>21</sup>H=CHC(O)-O-,  
R<sup>21</sup>H=C(COOR<sup>29</sup>)CH<sub>2</sub>C(O)O-



where R<sup>21</sup> is hydrogen or C<sub>1</sub>-C<sub>4</sub> alkyl;

R<sup>29</sup> is hydrogen, or a C<sub>1-4</sub> alkyl group;

A<sup>4</sup> is -O- or -NR<sup>22</sup>-;

R<sup>22</sup> is hydrogen or a C<sub>1</sub>-C<sub>4</sub> alkyl group [or R<sup>22</sup> is a group B<sup>3</sup>R<sup>16</sup>];

K<sup>4</sup> is a group -(CH<sub>2</sub>)<sub>r</sub>OC(O)-, -(CH)<sub>r</sub>C(O)O-,

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$-(\text{CH}_2)_r\text{OC}(\text{O})\text{O}-$ ,  $-(\text{CH}_2)_r\text{NR}^{22}-$ ,  $-(\text{CH}_2)_r\text{NR}^{22}\text{C}(\text{O})-$ ,

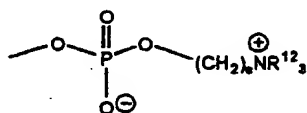
$-(\text{CH}_2)_r\text{C}(\text{O})\text{NR}^{22}-$ ,  $-(\text{CH}_2)_r\text{NR}^{22}\text{C}(\text{O})\text{O}-$ ,  $-(\text{CH}_2)_r\text{OC}(\text{O})\text{NR}^{22}-$ ,  $-(\text{CH}_2)_r\text{NR}^{22}\text{C}(\text{O})\text{NR}^{22}-$

[(in which the groups  $\text{R}^{22}$  are the same or different)],  $-(\text{CH}_2)_r\text{O}-$ ,  $-(\text{CH}_2)_r\text{SO}_3-$ , or a valence bond  
and  $r$  is from 1 to 12 and

$\text{R}^{20}$  is a cross-linkable group.

21. (Amended) A polymer according to claim 20 in which  $\text{R}^{20}$  is selected from the group consisting of cinnamyl, epoxy,  $-\text{CHOHCH}_2\text{Hal}$ , [(in which Hal is selected from the group consisting of chlorine, bromine [or] and iodine)], methylol, silyl groups having 1 to 3 halogen,  $\text{C}_{1-4}$  alkoxy or  $\text{C}_{2-4}$  alkanoyloxy substituents, acetylenically unsaturated groups, [and] acetoacetoxy, and chloroalkyl sulphone groups[, preferably the said silyl groups and epoxy groups].

22. (Amended) A polymer according to claim 20 [or claim 21] in which X is of formula  
VI



VI

where the groups  $\text{R}^{12}$  are the same or different and each is hydrogen or  $\text{C}_{1-4}$  alkyl, and

$e$  is from 1 to 4.

23. (Amended) A polymer according to [any of claims 20 to 22] claim 20 in which  $\text{R}^{15}$  is different to  $\text{Y}^1$  [and is preferably  $\text{CH}_2=\text{CH}-$ ].



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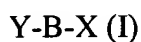
24. (Amended) A polymer according to [any of claims 20 to 23] claim 20 in which the monomers additionally include a diluent monomer[, preferably in a molar amount of at least 10%].

25. (Amended) A polymer according to [any of claims 20 to 24] claim 20 in which the mole ratio of zwitterionic monomer to comonomer of the general formula IX is in the range 1:20 to 20:1.

26. (Amended) A coating composition comprising a polymer according to [any of claims 20 to 25] claim 20 and a liquid vehicle in which the polymer is dissolved or dispersed.

27. (Amended) A [polymerisation] polymerization process in which there are [polymerised] polymerized by radical initiation ethylenically unsaturated monomers including

- a) a zwitterionic monomer of the general formula I

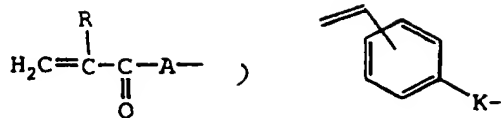


wherein B is a straight or branched alkylene, oxaalkylene or oligo-oxaalkylene chain optionally containing one or more fluorine atoms up to and including perfluorinated chains or, if X or Y contains a terminal carbon atom bonded to B, a valence bond;

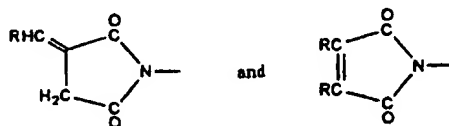
X is the zwitterionic group and

Y is an ethylenically unsaturated [polymerisable] polymerizable group selected from the group consisting of

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$\text{CH}_2=\text{C}(\text{R})-\text{CH}_2-\text{O}-$ ,  $\text{CH}_2=\text{C}(\text{R})-\text{CH}_2\text{OC}(\text{O})-$ ,  $\text{CH}_2=\text{C}(\text{R})\text{OC}(\text{O})-$ ,  $\text{CH}_2=\text{C}(\text{R})-\text{O}-$ ,  
 $\text{CH}_2=\text{C}(\text{R})\text{CH}_2\text{OC}(\text{O})\text{N}(\text{R}^1)-$ ,  $\text{R}^{30}\text{OCC}(\text{R})=\text{C}(\text{R})\text{C}(\text{O})-\text{O}-$ ,  $\text{RCH}=\text{CHC}(\text{O})\text{O}-$ ,  
 $\text{RCH}=\text{C}(\text{COOR}^{30})\text{CH}_2-\text{C}(\text{O})-\text{O}-$ ,



wherein:

R is hydrogen or a C<sub>1</sub>-C<sub>4</sub> alkyl group;

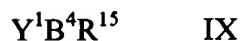
R<sup>30</sup> is hydrogen or a C<sub>1-4</sub> alkyl group; or BX

A is -O- or -NR<sup>1</sup>-; R<sup>1</sup> is hydrogen or a C<sub>1</sub>-C<sub>4</sub> alkyl group or R<sup>1</sup> is -B-X where B and X are as defined above; and

K is a group  $-(\text{CH}_2)_p\text{OC}(\text{O})-$ ,  $-(\text{CH}_2)_p\text{C}(\text{O})\text{O}-$ ,  
 $-(\text{CH}_2)_p\text{OC}(\text{O})\text{O}-$ ,  $-(\text{CH}_2)_p\text{NR}^2-$ ,  $-(\text{CH}_2)_p\text{NR}^2\text{C}(\text{O})-$ ,  
 $-(\text{CH}_2)_p\text{C}(\text{O})\text{NR}^2-$ ,  $-(\text{CH}_2)_p\text{NR}^2\text{C}(\text{O})\text{O}-$ ,  $-(\text{CH}_2)_p\text{OC}(\text{O})\text{NR}^2-$ ,  
 $-(\text{CH}_2)_p\text{NR}^2\text{C}(\text{O})\text{NR}^2-$ , [in which the groups R<sup>2</sup> are the same or different()],  $-(\text{CH}_2)_p\text{O}-$ ,  
 $-(\text{CH}_2)_p\text{SO}_3-$ , or, optionally in combination with B, a valence bond and p is from 1 to 12 and R<sup>2</sup> is hydrogen or a C<sub>1</sub>-C<sub>4</sub> alkyl group;

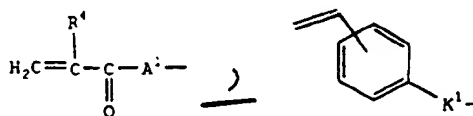
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b) a dual ethylenically unsaturated monomer of the general formula IX:

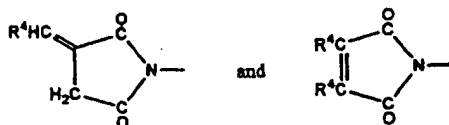


wherein  $B^4$  is a straight or branched alkylene, oxaalkylene or oligo-oxaalkylene chain optionally containing one or more fluorine atoms up to and including perfluorinated chains, or a valence bond;

$Y^1$  is an ethylenically unsaturated [polymerisable] polymerizable group selected from the group consisting of



$CH_2=C(R^4)-CH_2-O-$ ,  $CH_2=C(R^4)-CH_2OC(O)-$ ,  $CH_2=C(R^4)OC(O)-$ ,  $CH_2=C(R^4)-O-$ ,  
 $CH_2=C(R^4)CH_2OC(O)N(R^5)-$ ,  $R^{31}OOC R^4=CR^4C(O)-O-$ ,  $R^4H=CHC(O)-O-$ ,  
 $R^4H=C(COOR^{31})CH_2C(O)O-$



where  $R^4$  is hydrogen or  $C_1$ - $C_4$  alkyl;

$R^{31}$  is hydrogen, a  $C_{1-4}$  alkyl group or a group  $B^4 R^3$ ;

$A^1$  is  $-O-$  or  $-NR^5-$ ;

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$R^5$  is hydrogen or a  $C_1$ - $C_4$  alkyl group [or  $R^5$  is a group Q];

$K^1$  is a group  $-(CH_2)_1OC(O)-$ ,  $-(CH)_1C(O)O-$ ,  
 $-(CH_2)_1OC(O)O-$ ,  $-(CH_2)_1NR^6-$ ,  $-(CH_2)_1NR^6C(O)-$ ,  
 $-(CH_2)_1C(O)NR^6-$ ,  $-(CH_2)_1NR^6C(O)O-$ ,  $-(CH_2)_1OC(O)NR^6-$ ,  $-(CH_2)_1NR^6C(O)NR^6-$  [(in which  
the groups  $[R^{16}] R^6$  are the same or different)],  $-(CH_2)_1O-$ ,  $-(CH_2)_1SO_3-$ , [or] a valence bond and  
1 is from 1 to 12 and  $R^6$  is hydrogen or a  $C_1$ - $C_4$  alkyl group; and

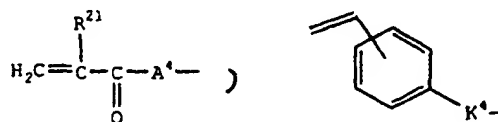
$R^{15}$  is an ethylenically unsaturated organic group, and

c) cross-linkable monomer of the general formula XI



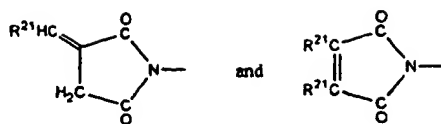
in which  $B^3$  is straight or branched alkylene, oxaalkylene or oligo-oxaalkylene chain optionally  
containing one or more fluorine atoms up to and including perfluorinated chains, or a valance  
bond;

$Y^3$  is an ethylenically unsaturated [polymerisable] polymerizable group selected from the  
group consisting of



$CH_2=C(R^{21})-CH_2-O-$ ,  $CH_2=C(R^{21})-CH_2OC(O)-$ ,  $CH_2=C(R^{21})OC(O)-$ ,  $CH_2=C(R^{21})-O-$ ,  
 $CH_2=C(R^{21})CH_2OC(O)N(R^{22})-$ ,  $R^{29}OCC(R^{21})=C(R^{21})C(O)-O-$ ,  $R^{21}H=CHC(O)-O-$ ,  
 $R^{21}H=C(COOR^{29})CH_2C(O)O-$

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where  $R^{21}$  is hydrogen or  $C_1$ - $C_4$  alkyl;

$R^{29}$  is hydrogen, or a  $C_{1-4}$  alkyl group;

$A^4$  is  $-O-$  or  $-NR^{22}-$ ;

$R^{22}$  is hydrogen or a  $C_1$ - $C_4$  alkyl group [or  $R^{22}$  is a group  $B^3R^{16}$ ];

$K^4$  is a group  $-(CH_2)_rOC(O)-$ ,  $-(CH)_rC(O)O-$ ,

$-(CH_2)_rOC(O)O-$ ,  $-(CH_2)_rNR^{22}-$ ,  $-(CH_2)_rNR^{22}C(O)-$ ,

$-(CH_2)_rC(O)NR^{22}-$ ,  $-(CH_2)_1NR^{22}C(O)O-$ ,  $-(CH_2)_rOC(O)NR^{22}-$ ,  $-(CH_2)_rNR^{22}C(O)NR^{22}-$

[(in which the groups  $R^{22}$  are the same or different)],  $-(CH_2)_rO-$ ,  $-(CH_2)_rSO_3-$ , or a valence bond

and  $r$  is from 1 to 12 and

$R^{20}$  is different to  $R^{15}$  and is a cross-linkable group.

28. (Amended) A coating process [in which] including the steps of

a) coating a polymer according to claim 20 [any of claims 20 to 25 is coated] onto a substrate and [is subsequently cross-linked]

b) cross-linking the polymer.

29. (Amended) A process according to claim 28 in which the coating step involves coating the substrate with a liquid composition [according to claim 26,] consisting of the

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polymer dissolved or dispersed in a solvent to form a liquid coating, and solidifying the polymer, [preferably] by evaporation of solvent from the liquid coating.

30. (Amended) A substrate having a cross-linked coating of a polymer produced by the process of claim 28 [or claim 29].